CLAIMS

1. An ink jet recording apparatus, comprising a head assembly section provided with a plurality of nozzles and a plurality of pressure chambers storing ink therein and communicated respectively to the nozzles, a plurality of pressure application means for applying a pressure on the ink in the respective pressure chambers so as to discharge ink droplets through the nozzles onto a recording medium, and driving pulse supply means for supplying, to the pressure application means, a driving pulse for driving the pressure application means, wherein:

the nozzles include at least a first nozzle and a second nozzle that are arranged in a direction perpendicular to a relative movement direction in which the head assembly section is relatively moved with respect to the recording medium while discharging ink; and

the driving pulse supply means selectively supplies a first driving pulse and a second driving pulse, the first driving pulse including a preliminary pulse for vibrating an ink meniscus in a tip portion of the nozzle and a discharge pulse for discharging an ink droplet through the nozzle in this order, and the second driving pulse including the discharge pulse, wherein the first driving pulse is supplied to the pressure application means corresponding to the first nozzle while the second driving pulse is supplied to the pressure application means corresponding to the second nozzle.

2. An ink jet recording apparatus, comprising a head assembly section provided with a plurality of nozzles and a plurality of pressure chambers storing ink therein and communicated respectively to the nozzles, a plurality of pressure application means for applying a pressure on the ink in the respective pressure chambers so as to discharge ink droplets through the nozzles onto a recording medium, and driving pulse supply means for supplying, to the pressure application means, a driving pulse for driving the pressure application means, wherein:

the nozzles include a plurality of nozzles that are arranged in a direction perpendicular to a relative movement direction in which the head assembly section is relatively moved with respect to the recording medium while discharging ink; and

the driving pulse supply means selectively supplies a first driving pulse and a second driving pulse, the first driving pulse including a preliminary pulse for vibrating an ink meniscus in a tip portion of the nozzle and a discharge pulse for discharging an ink droplet through the nozzle in this order, and the second driving pulse including the discharge pulse, wherein the first driving pulse is supplied to the pressure application means corresponding at least one of the plurality of nozzles in a predetermined printing period while the second driving pulse is supplied thereto in a printing period different from the predetermined printing period.

3. The ink jet recording apparatus of claim 2, wherein:

the ink jet recording apparatus further comprises reference pulse generation means for generating a reference pulse including a first reference pulse and a second reference pulse, the first reference pulse including the preliminary pulse and the discharge pulse in this order, and the second reference pulse including the discharge pulse; and

the driving pulse supply means supplies, to the pressure application means, the reference pulse generated by the reference pulse generation means as the driving pulse.

4. The ink jet recording apparatus of claim 3, wherein a waveform of the discharge pulse of the first reference pulse and that of the discharge pulse of the second reference pulse are different from each other.

5. The ink jet recording apparatus of claim 1, wherein where the driving pulse supply means supplies at least three first driving pulses, an interval between the first one of the first driving pulses and the second one of the first driving pulses is different from that between the second one of the first driving pulses and the third one of the first driving pulses.

6. The ink jet recording apparatus of claim 2, wherein where the driving pulse supply means supplies at least three first driving pulses, an interval between the first one of the first driving pulses and the second one of the first driving pulses is different from that between the second one of the first driving pulses and the third one of the first driving pulses.

7. An ink jet recording apparatus, comprising a head assembly section provided with a plurality of nozzles and a plurality of pressure chambers storing ink therein and communicated respectively to the nozzles, a plurality of pressure application means for applying a pressure on the ink in the respective pressure chambers so as to discharge ink droplets through the nozzles onto a recording medium, and driving pulse supply means for supplying, to the pressure application means, a driving pulse for driving the pressure application means, wherein:

the nozzles include at least a first nozzle and a second nozzle that are arranged in a direction perpendicular to a relative movement direction in which the head assembly section is relatively moved with respect to the recording medium while discharging ink;

when the same driving pulse is supplied to the pressure application means corresponding to the first nozzle and to the pressure application means corresponding to the second nozzle, an ink droplet discharged through the second nozzle forms an ink dot whose diameter is a predetermined reference diameter and whose landing position is a reference landing position on the recording medium, while an ink droplet discharged through the first nozzle forms an ink dot whose diameter is different from the predetermined reference diameter and/or whose landing position is shifted from the reference landing position; and

the driving pulse supply means selectively supplies a first driving pulse and a second driving pulse, the first driving pulse including a preliminary pulse for vibrating an ink meniscus in a tip portion of the nozzle and a discharge pulse for discharging an ink

droplet through the nozzle in this order, and the second driving pulse including the discharge pulse, wherein the first driving pulse is supplied to the pressure application means corresponding to the first nozzle while the second driving pulse is supplied to the pressure application means corresponding to the second nozzle.

8. The ink jet recording apparatus of claim 1, wherein:

the ink jet recording apparatus further comprises reference pulse generation means for generating a reference pulse for driving the pressure application means;

the reference pulse includes the preliminary pulse and the discharge pulse; and

the driving pulse supply means produces one of the first and second driving pulses from the preliminary pulse and the discharge pulse generated by the reference pulse generation means, and supplies the produced pulse to the pressure application means.

9. The ink jet recording apparatus of claim 2, wherein:

the ink jet recording apparatus further comprises reference pulse generation means for generating a reference pulse for driving the pressure application means;

the reference pulse includes the preliminary pulse and the discharge pulse; and

the driving pulse supply means produces one of the first and second driving pulses from the preliminary pulse and the discharge pulse generated by the reference pulse generation means, and supplies the produced pulse to the pressure application means.

10. The ink jet recording apparatus of claim 7, wherein:

the ink jet recording apparatus further comprises reference pulse generation means for generating a reference pulse for driving the pressure application means;

the reference pulse includes the preliminary pulse and the discharge pulse; and

the driving pulse supply means produces one of the first and second driving pulses from the preliminary pulse and the discharge pulse generated by the reference pulse generation means, and supplies the produced pulse to the pressure application means.

11. The ink jet recording apparatus of claim 1, wherein an amplitude of the

preliminary pulse is equal to that of the discharge pulse, and a pulse width of the preliminary pulse is 1/40 to 1/5 of a Helmholtz period of the head assembly section.

12. The ink jet recording apparatus of claim 2, wherein an amplitude of the preliminary pulse is equal to that of the discharge pulse, and a pulse width of the preliminary pulse is 1/40 to 1/5 of a Helmholtz period of the head assembly section.

13. The ink jet recording apparatus of claim 7, wherein an amplitude of the preliminary pulse is equal to that of the discharge pulse, and a pulse width of the preliminary pulse is 1/40 to 1/5 of a Helmholtz period of the head assembly section.

14. The ink jet recording apparatus of claim 1, wherein an interval between a start of the preliminary pulse and a start of the discharge pulse in the first driving pulse is less than or equal to twice a Helmholtz period of the head assembly section.

15. The ink jet recording apparatus of claim 2, wherein an interval between a start of the preliminary pulse and a start of the discharge pulse in the first driving pulse is less than or equal to twice a Helmholtz period of the head assembly section.

16. The ink jet recording apparatus of claim 7, wherein an interval between a start of the preliminary pulse and a start of the discharge pulse in the first driving pulse is less than or equal to twice a Helmholtz period of the head assembly section.

17. The ink jet recording apparatus of claim 1, wherein a landing position of a first ink dot that is formed by supplying the second driving pulse to the pressure application means and that of a second ink dot that is formed by supplying the first driving pulse to the pressure application means are different from each other with respect to the direction perpendicular to the relative movement direction.

18. The ink jet recording apparatus of claim 2, wherein a landing position of a first ink dot that is formed by supplying the second driving pulse to the pressure application means and that of a second ink dot that is formed by supplying the first driving pulse to the pressure application means are different from each other with respect to the

direction perpendicular to the relative movement direction.

19. The ink jet recording apparatus of claim 7, wherein a landing position of a first ink dot that is formed by supplying the second driving pulse to the pressure application means and that of a second ink dot that is formed by supplying the first driving pulse to the pressure application means are different from each other with respect to the direction perpendicular to the relative movement direction.

20. The ink jet recording apparatus of claim 17, wherein when the preliminary pulse is supplied to the pressure application means, a cross section, perpendicular to the relative movement direction, of the ink meniscus in the tip portion of the nozzle corresponding to the pressure application means is asymmetric about an axis of the nozzle.

21. The ink jet recording apparatus of claim 18, wherein when the preliminary pulse is supplied to the pressure application means, a cross section, perpendicular to the relative movement direction, of the ink meniscus in the tip portion of the nozzle corresponding to the pressure application means is asymmetric about an axis of the nozzle.

22. The ink jet recording apparatus of claim 19, wherein when the preliminary pulse is supplied to the pressure application means, a cross section, perpendicular to the relative movement direction, of the ink meniscus in the tip portion of the nozzle corresponding to the pressure application means is asymmetric about an axis of the nozzle.

23. The ink jet recording apparatus of claim 17, wherein each of the nozzles arranged in the direction perpendicular to the relative movement direction is shifted from a center of the pressure chamber that is communicated to the nozzle with respect to the direction perpendicular to the relative movement direction.

24. The ink jet recording apparatus of claim 18, wherein each of the nozzles arranged in the direction perpendicular to the relative movement direction is shifted from a center of the pressure chamber that is communicated to the nozzle with respect to the direction perpendicular to the relative movement direction.

25. The ink jet recording apparatus of claim 19, wherein each of the nozzles arranged in the direction perpendicular to the relative movement direction is shifted from a center of the pressure chamber that is communicated to the nozzle with respect to the direction perpendicular to the relative movement direction.

26. The ink jet recording apparatus of claim 17, wherein a cross section, perpendicular to the relative movement direction, of each of the nozzles arranged in the direction perpendicular to the relative movement direction is asymmetric about an axis of the nozzle.

27. The ink jet recording apparatus of claim 18, wherein a cross section, perpendicular to the relative movement direction, of each of the nozzles arranged in the direction perpendicular to the relative movement direction is asymmetric about an axis of the nozzle.

28. The ink jet recording apparatus of claim 19, wherein a cross section, perpendicular to the relative movement direction, of each of the nozzles arranged in the direction perpendicular to the relative movement direction is asymmetric about an axis of the nozzle.

29. The ink jet recording apparatus of claim 17, wherein a distance between a center of the first ink dot and a center of the second ink dot with respect to the direction perpendicular to the relative movement direction is less than or equal to 1/2 of a pitch of the ink dots.

30. The ink jet recording apparatus of claim 18, wherein a distance between a center of the first ink dot and a center of the second ink dot with respect to the direction perpendicular to the relative movement direction is less than or equal to 1/2 of a pitch of the ink dots.

31. The ink jet recording apparatus of claim 19, wherein a distance between a center of the first ink dot and a center of the second ink dot with respect to the direction

perpendicular to the relative movement direction is less than or equal to 1/2 of a pitch of the ink dots.

32. The ink jet recording apparatus of claim 1, wherein the driving pulse supply means selectively supplies, in addition to the first driving pulse and the second driving pulse, a third driving pulse including the preliminary pulse.

33. The ink jet recording apparatus of claim 2, wherein the driving pulse supply means selectively supplies, in addition to the first driving pulse and the second driving pulse, a third driving pulse including the preliminary pulse.

34. The ink jet recording apparatus of claim 7, wherein the driving pulse supply means selectively supplies, in addition to the first driving pulse and the second driving pulse, a third driving pulse including the preliminary pulse.

35. The ink jet recording apparatus of claim 1, wherein each of the pressure application means is a piezoelectric element.

36. The ink jet recording apparatus of claim 2, wherein each of the pressure application means is a piezoelectric element.

37. The ink jet recording apparatus of claim 7, wherein each of the pressure application means is a piezoelectric element.